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Signed Stephen Hordley

Dated 11 November 2003

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310 E759958-3 D02819
P01/7700 0.00-0225335.9

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

C437/G

2. Patent application number
(The Patent Office will fill in this part)

0225335.9

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Genevac Limited
The Sovereign Centre
Farthing Road
Ipswich
IP1 5AP

Patents ADP number *(if you know it)*

4691220007

If the applicant is a corporate body, give the country/state of its incorporation

Great Britain

4. Title of the invention

Temperature Sensing in Centrifugal Evaporators

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Keith W Nash & Co
90-92 Regent Street
Cambridge
CB2 1DP

Patents ADP number *(if you know it)*

1206001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

Yes a)

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	0
Description	4
Claim(s)	0 CF
Abstract	0
Drawing(s)	5 + S

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature [signature] Date 30/10/01

Keith W Nash & Co, Agents

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr Nash (01223) 355477

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Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.*

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c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

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C437/G

Title Temperature Sensing in Centrifugal Evaporators

Field of invention

This invention concerns centrifugal evaporators and in particular methods and apparatus by which the temperature within an evaporation chamber can be sensed.

Background to the invention

When drying pharmaceutical compounds by evaporation, such as centrifugal evaporators, it can be important that the material being evaporated is not subjected to temperatures that could damage one or more of the sample components making up the mixture. However, in order to achieve rapid evaporation heat has to be supplied to the sample material during evaporation to balance the heat lost due to the evaporation (the latent heat) of the solvent. In order to achieve these two, possibly conflicting, requirements, it is necessary to accurately monitor the temperature of the sample material, for example to ensure that certain maximum temperatures are not exceeded.

UK Patent Specification 2334688 describes the use of temperature sensing probes placed in or adjacent to samples in a chamber with means for transferring the temperature data from a sensor on the rotor to a system controller remote from the rotor typically external of the chamber. UK Patent Application 0105345.3 describes the use of a non-contact temperature sensing device to sense the temperature of a disc rotor, in which sample containers are fixed in position.

Problems arise when employing a non-contact sensing device in a chamber in which the sample containers move (typically swing upwardly and outwardly) as a rotor gathers speed to generate centrifugal forces on the sample material in the containers. Figure 1 shows an example of this type of rotor.

In general, non-contact temperature sensing devices have a wide field of view. Even so, a single temperature sensing device will only 'see' the swing during part of each rotation of the rotor. Heat transfer between rotor and swing is usually poor, so that if for example heat is supplied by an infra-red (IR) lamp, when the IR lamp is on, the rotor will tend to become heated to a significantly higher temperature than the or each swing, and the sample material in containers such as test tubes therein. Therefore if the sensor is also responsive to the rotor temperature (as is usually the case) and this will cause the temperature information from the sensor to suggest a higher sample temperature than will actually exist in the sample material.

Non-contact temperature sensing devices often employ a viewing window (lens), which tends to be susceptible to contamination during evaporation, thus interfering with the temperature monitoring function.

It is an object of the present invention to provide an improved system for non-contact temperature measurement in a centrifugal evaporator.

Summary of the invention

The invention allows a non-contact sensing temperature device to be employed in a centrifugal evaporator where sample containers are carried by a rotor and are mounted so as to swing-up as the rotor speed increases, and according to one aspect of the invention, the temperature sensing device comprises an infra-red pyrometer having a narrow field of view and being mounted in the evaporating chamber such that the swing at least partly occupies the pyrometer field of view during part of each rotation of the rotor, while the rotor itself does not (or substantially does not) enter the pyrometer field of view during rotor rotation.

Typically the angle of the field of view is such that the diameter of the field of view is always $1/10^{th}$ its distance from the pyrometer (where the latter can be considered to be a point source/detector).

Preferably the position of the pyrometer within the chamber is chosen so that the pyrometer field of view is never intersected by the rotor.

Typically a vertical plane passing along the centre of the field of view is arranged to make an acute angle to another vertical plane drawn in a radial direction between the sensor and the centre of rotation of the rotor. The acute angle is chosen to maximise the duration that the swinging container(s) (swing) is/are within the field of view. Figure 4a and 4b show the start point and exit point for oppositely mounted swinging containers (swings) as they enter and exit the field of view.

Typically the acute angle is in the range 10 to 80 degrees.

Preferably the direction of rotation of the rotor is chosen so that any debris thrown from the rotor during evaporation will not impact on the sensor of the pyrometer.

The temperature of the chamber is preferably measured at a location close to the area where the IR pyrometer is viewing the inner surface of the chamber. Data relating to this temperature can be used in a simple equation to correct the raw temperature data from the pyrometer.

IR pyrometers are affected by changes in their ambient conditions, and therefore preferably the temperature of the body of the IR pyrometer is measured to provide data to allow temperature compensation to be applied to the raw temperature data from the pyrometer.

In the drawings:

Figure 1 illustrates a swing type rotor as incorporated in a centrifugal evaporator chamber;

Figure 2 illustrates a preferred arrangement embodying the invention, incorporating an Infra-red pyrometer detector;

Figure 3 illustrates a preferred field of view for the Infra-red pyrometer of Figure 2;

Figure 4 shows the swing just entering the field of view; and

Figure 5 shows the swing just exiting from the field of view of the pyrometer.

FIGURE 1 — [redacted]JING TYPE ROTOR[redacted]

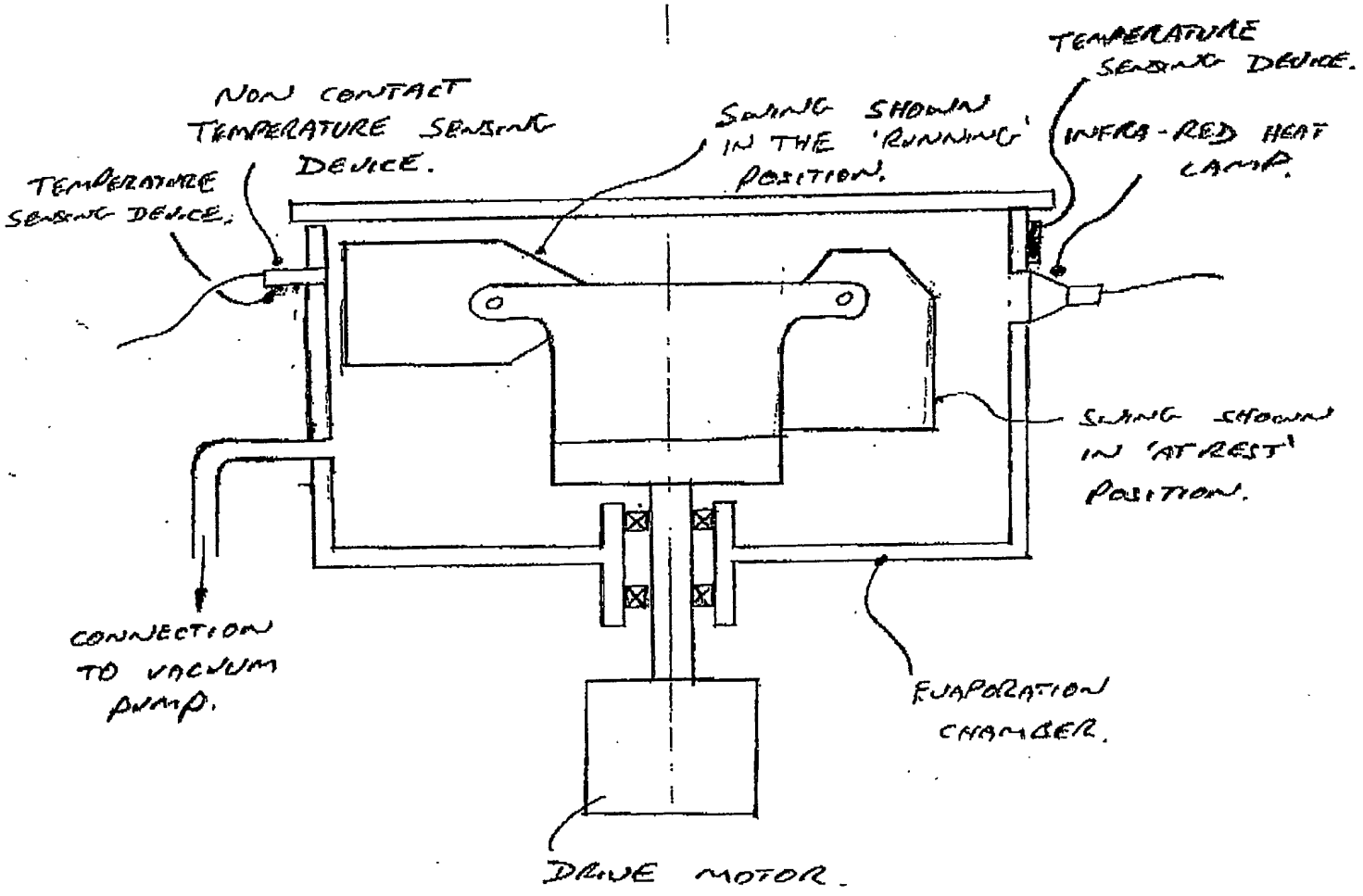


Figure 2 – Preferred Method for applying an Infra-red Pyrev[illegible]er

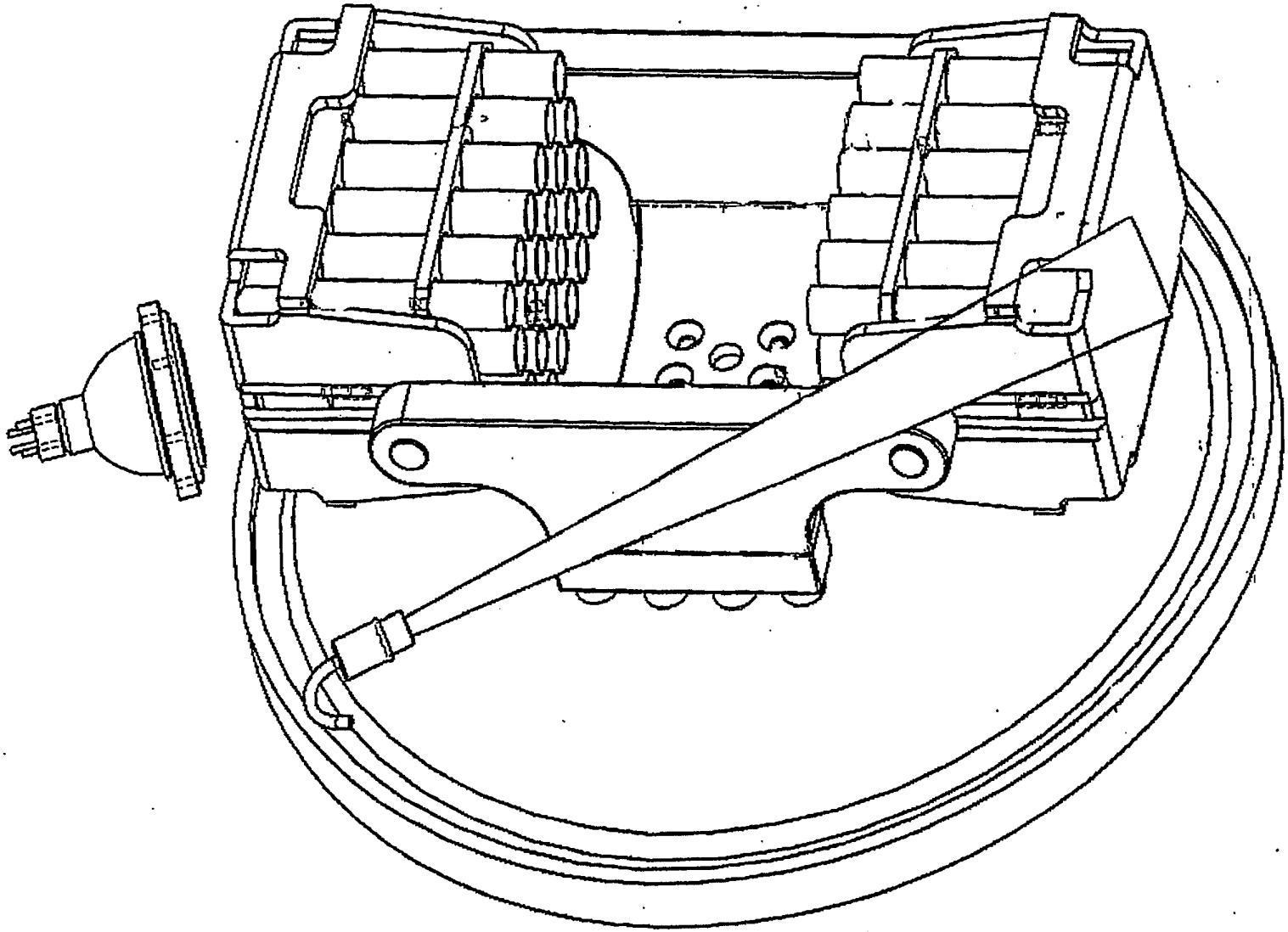


FIGURE 3 - [redacted] OF VIEW OF [redacted]
INFRA-RED PYROMETER.

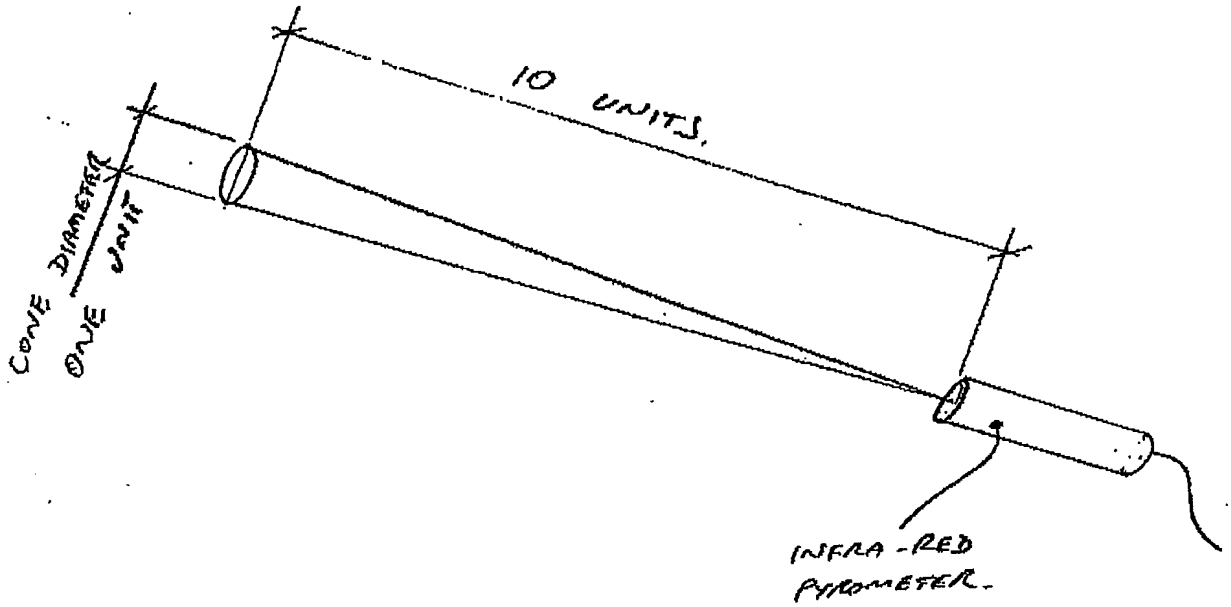


Figure 4a - Position of the swing entry into the field of view

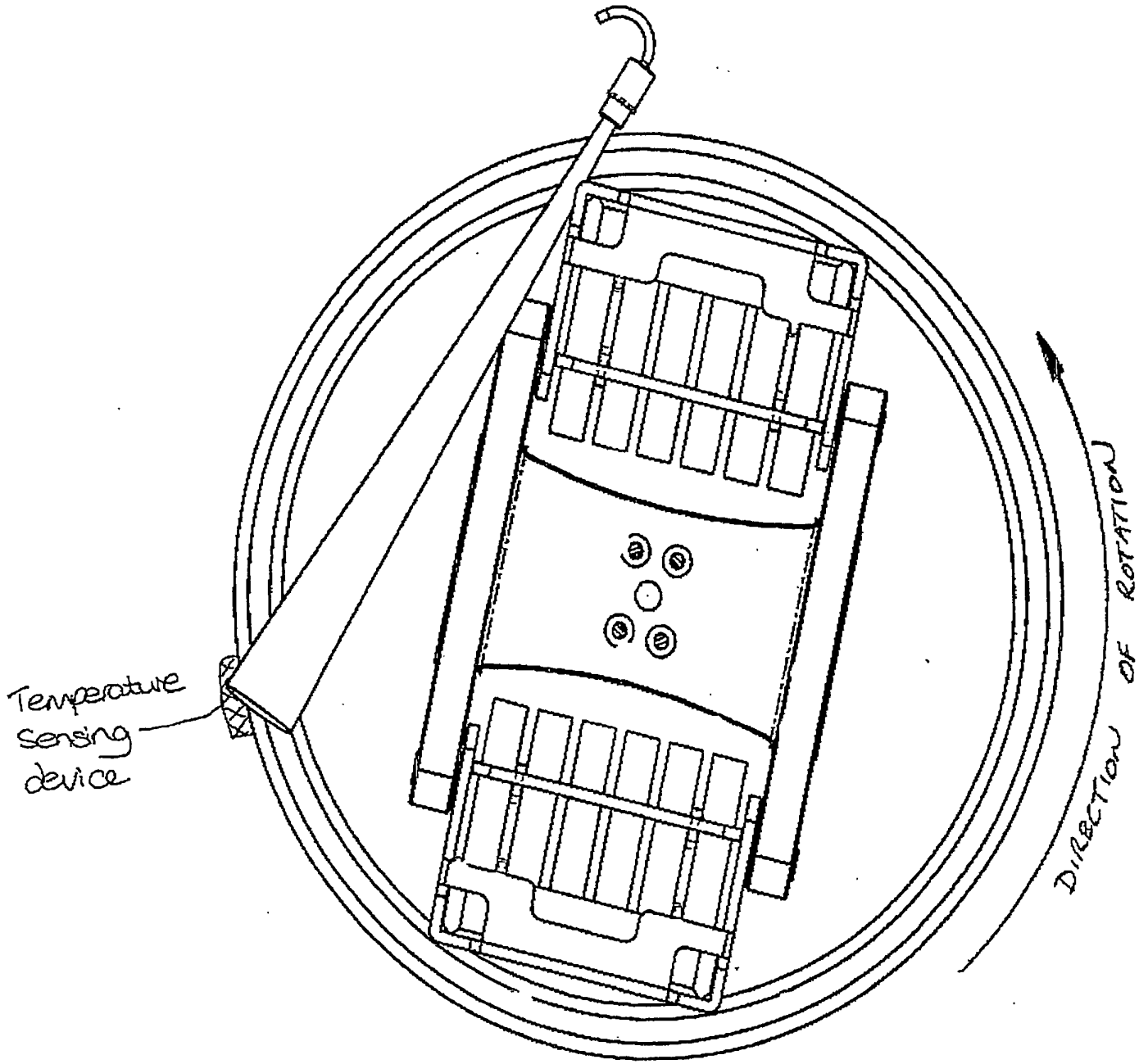
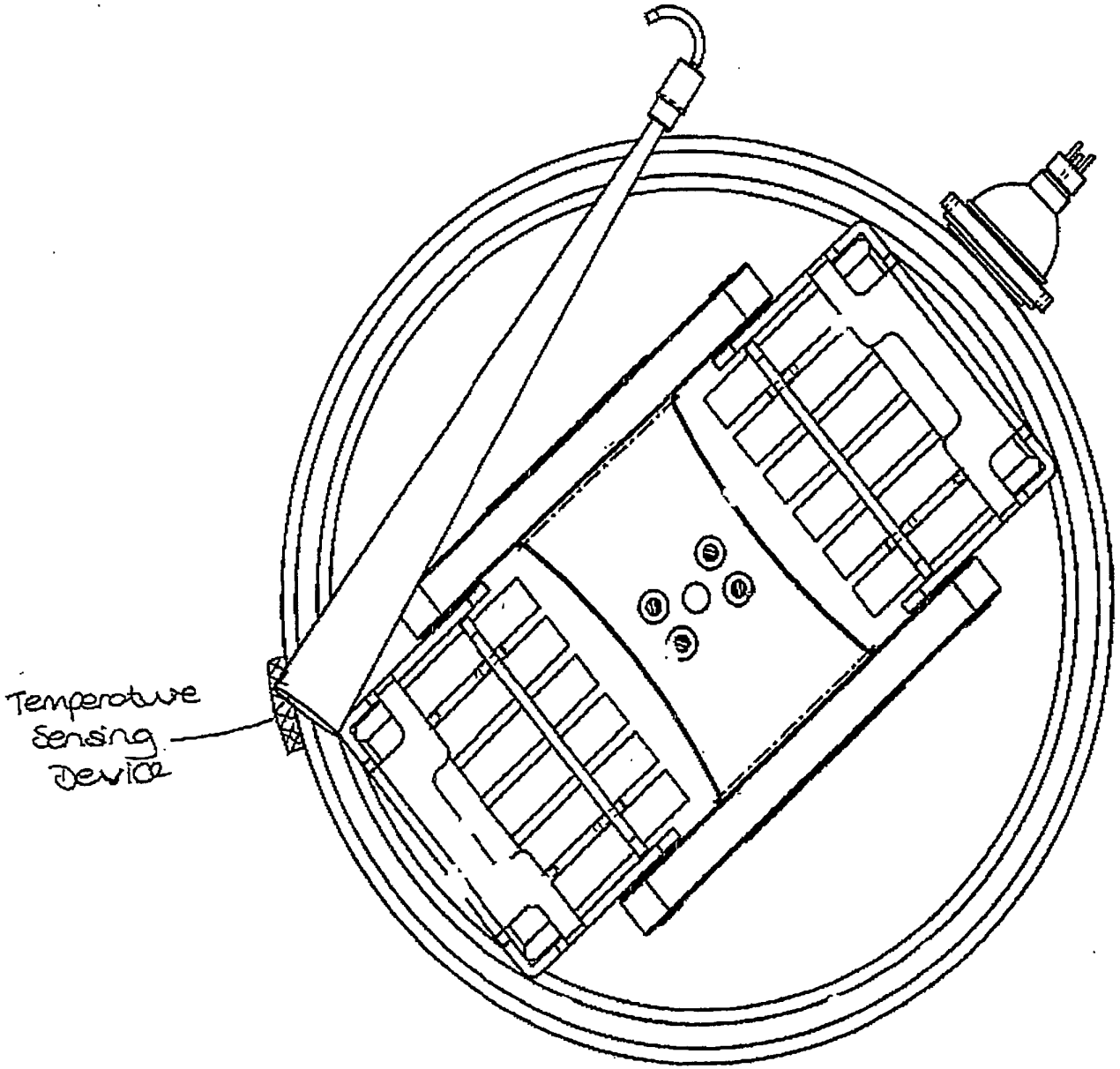


Figure 4b Position of the swing exiting from the field of view



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